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ROGER W. SPERRY, University of Chicago.

Functional results of muscle transplantation in the hind limb of the albino rat.

Muscle transpositions in the hind limb of the albino rat were performed so that contraction of the main dorsi-flexor muscles of the foot (m. tibialis anterior, m. extensor digitorum longus) produced plantar flexion instead of dorsi-flexion, and contraction of the lateral gastrocnemius muscle, normally a plantar flexion of the foot, produced dorsi-flexion instead of plantar flexion. All other shank muscles were removed. Nine rats (seven unilateral and two bilateral cases) exhibited both in 'spontaneous' and reflex activity complete reversal of all plantar and dorsi-flexor phases of the movements of the operated limbs. This reversal persisted for more than 10 months with no functional adjustment either in common activities or in special trained performances demanding a single elementary foot movement.

Analysis showed that the reversal was due to clear-cut reciprocal contraction and relaxation of the transposed muscles; that mechanically the transposed muscles were capable of producing normal movement; and that the sensitivity of the shank, ankle, foot, and transposed muscles had not been impaired by the operation. Amputation of contralateral foot, amputation of front legs, training the rats to rise on hind limbs as well as to climb a 45 cm. ladder for food, failed to result in reeducation of the foot movements.

This unmodifiability of the contraction patterns in the hind limb musculature of the rat compares more closely with conditions found in amphibians than with those reported for higher mammals.

See also demonstration number 151.